



Conference Abstract

# Aquatic biofilms can act as natural environmental DNA samplers

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## Abstract

Diatoms, macroinvertebrates and fish communities are widely used for the assessment of the ecological status of rivers and lakes. Metabarcoding studies of these communities are usually performed from “bulk” samples in the case of diatoms and macroinvertebrates; and from water samples in the case of fish.

Recent studies, suggest that aquatic biofilms can physically act as environmental catchers of environmental DNA (eDNA) (e.g. Mariani et al. 2019). Thus, we propose an alternative metabarcoding approach to study macroinvertebrates and fishes directly from this matrix.

The capacity of aquatic biofilms to catch macroinvertebrate eDNA was tested from a previous study in Mayotte Island where both biofilm samples and macroinvertebrate morphological inventories were available at same river sites (Rivera et al. 2021). First, macroinvertebrate specimens were identified based on their morphological characteristics. Second, DNA was extracted from biofilms, and macroinvertebrate communities were targeted using a standard COI barcode. The resulting morphological and molecular inventories were compared. Our results showed that both methods provided comparable structures and diversities for macroinvertebrate communities when using unassigned OTUs suggesting that macroinvertebrate DNA is present in biofilms and representative of the communities. However, after taxonomic assignment of OTUs, diversity and richness were no longer correlated. Indeed, many constraints were observed as the need for: a)

more specific primers to avoid co-amplification of untargeted taxa inhabiting biofilms, b) primers targeting shorter barcodes to sequence more easily degraded eDNA that may be captured in biofilms, and c) a reference database well adapted to our tropical study sites. Finally, even if the results of this first study were encouraging, we wanted to test the biofilm approach on organisms that do not inhabit this environmental matrix in order to be able to distinguish between intra or extra-cellular DNA.

Based on these observations, a second study looking for a fish eDNA signal in aquatic biofilms was performed. Environmental biofilm and water samples were collected in parallel at littoral sites at Lake Geneva. DNA was extracted from these samples, and fish communities were targeted using a standard 12S barcode. The molecular inventories derived from the biofilm and the water samples were compared. Both methods provide comparable floristic lists, providing a novel approach for ecological studies related to fish phenology using eDNA in biofilms.

Our results open the door to the study of diatoms, macroinvertebrates and fish communities through metabarcoding from a single matrix reducing sampling efforts and costs.

## Keywords

Biofilms, macroinvertebrates, fish, DNA metabarcoding, DNA sampler

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